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Feature Article - Cessation of the Composite Leading Indicator

About a decade ago, the ABS developed its Experimental Composite Leading Indicator (XCLI), a single time series designed to provide early signals of turning points in the Australian business cycle. During the past few years, we have observed a deterioration in its predictive performance. The ABS recently reviewed the XCLI, and has decided to discontinue it.

This article summarises the scope and findings of the review. It also describes ABS plans for related analyses which will be reported in future issues of **Australian Economic Indicators**.

THE XCLI-ITS PURPOSE AND CHARACTERISTICS

Understanding the future course of economic activity is of considerable interest to policy makers and other users. Analysts aim for a wide variety of forecasting targets, such as recessions and recoveries, peaks and troughs in the business cycle, accelerations and decelerations in activity and so on. They use a wide variety of forecasting tools, such as multivariate econometric models, univariate time series models and other extrapolation techniques, suites of leading indicators and composite indicators.

The ABS developed the XCLI to supplement, not compete with, other forms of economic analysis and forecasting.

- The **target** of the XCLI is turning points in the Australian business cycle-that is, the peaks and troughs that occur in trend gross domestic product (GDP) once the long-term or secular trend has been removed.
- The XCLI is a **composite quarterly time series** summarising the early signals of turning points provided by eight component indicators-US GDP, a terms-of-trade factor, housing finance commitments, job vacancies, a share price index, real interest rates, business expectations and production expectations-that have, collectively, been observed to possess leading indicator properties.
- The **statistical tools** used to extract the growth-cycle components from GDP and the component indicators are akin to those used by the ABS when compiling seasonally adjusted and trend time series, namely Henderson moving averages.

The developers of the XCLI based their investigations on Australian economic data for the 1970s and 1980s. They assembled a large array of possibly leading indicators, based on considerations such as the following:

- economic theory may have suggested a causal or other leading relationship between the indicator and general economic activity-eg interest rates
- an indicator may have embodied expectations about future activity-eg business expectations regarding future sales

- an indicator may have reflected the early stages of production or other economic processes-eg housing finance commitments
- an indicator may have been one of the earliest to adjust to changes in overall activity-eg hours of overtime worked.

The timing relationships between turning points in GDP and turning points in individual indicators during the 1970s and 1980s were analysed. The large array of candidate indicators was winnowed to a set of eight that collectively displayed fairly stable lead times before business cycle turning points. Those eight were then used to construct the composite XCLI series. The indicators that actually found their way into the XCLI were mostly of the first and second kinds listed above.

More details of the methods used to construct the XCLI are provided in an ABS **Information Paper: An Experimental Composite Leading Indicator of Australian Economic Activity** (cat. no. 1347.0) and are summarised in quarterly articles that have appeared in Australian Economic Indicators.

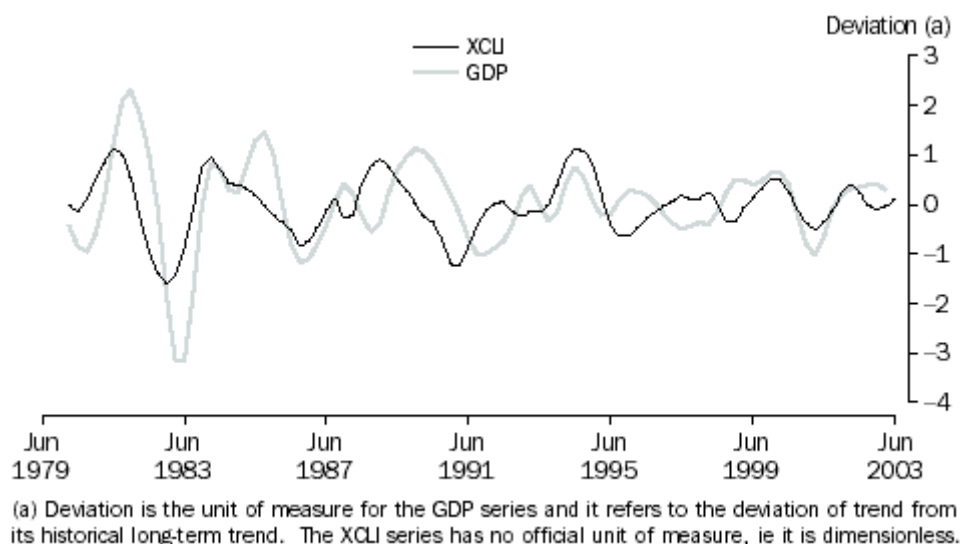
PREDICTIVE PERFORMANCE

During the 1970s and 1980s and the early years of the 1990s, the XCLI led turning points in the business cycle by two quarters (six months) on average. The length of lead time before particular peaks and troughs varied somewhat, but the XCLI did not miss or falsely predict any turning points.

During the second half of the 1990s, however, the XCLI has not performed well. For example:

- In the December quarter 1995, there was a peak in the business cycle which the XCLI failed to predict. The peak was largely attributable to the effects of a good farm season, and the XCLI does not contain a component indicator associated directly with variations in farm product. When one uses a business cycle based on non-farm GDP, the XCLI's performance appears rather better.
- In the December quarter 1999, there was a peak in the XCLI. According to average historical patterns, the business cycle might have been expected to peak about two quarters later (ie, in the June quarter 2000); in fact, the peak occurred in the March quarter 2000. More generally, the XCLI's lead time (ie, the amount of warning it gives of an approaching peak or trough in the business cycle) appears to have shortened.
- In recent times, the XCLI occasionally signals a forthcoming turning point but a quarter or two later (when additional data become available) the signal is attenuated or disappears. The XCLI currently displays a peak in March 2002, however it is unclear whether this represents a permanent change in direction for the business cycle, given no apparent turnaround in GDP up to March 2003.

1. EXPERIMENTAL COMPOSITE LEADING INDICATOR (XCLI) AND ITS TARGET, THE BUSINESS CYCLE IN GDP



REVIEW OF THE XCLI-MOTIVATION AND SCOPE

In the light of such deteriorating predictive performance, the ABS decided last year to review the XCLI. The main questions addressed by the review were as follows:

- Has the deterioration in predictive performance been attributable to individual indicators?
- Are there other indicators that would provide better predictive performance?
- Are there better ways of extracting the business cycle components of GDP and the individual indicators-or would some other methodological change improve the XCLI's performance?

REVIEWING COMPONENT INDICATORS

For a composite leading indicator to exhibit good predictive performance, it is not necessary that every component indicator provides an early signal of every turning point in the business cycle. Indeed, the rationale for constructing a composite indicator is that each peak and trough in economic activity may reflect a somewhat different constellation of events, so the predictive value of the component indicators varies from cycle to cycle. But the set of component indicators should **collectively** give early warning of all turning points.

It would be of concern if a majority of the eight component indicators were to display deteriorating predictive performance. And that appears to have happened. Some of the components have failed to provide any early signal of certain recent turning points in the business cycle-they have exhibited no nearby turning point; or their turning points have lagged those in the business cycle. For other components, the lead time has become much more variable during the second half of the 1990s. See the Table.

CHRONOLOGY OF TURNING POINTS IN THE AUSTRALIAN BUSINESS CYCLE AND COMPONENTS OF THE XCLI

Turning Points	T	P	T	P	T	P	T	P	T	P	T	Mean Lag or Lead	Median Lag or Lead
GDP CVM	80:2	81:4	83:2	85:3	86:3	89:4	91:4	94:2	97:2	00:01	01:01		
All Industrials	na	81:2	82:4	na	na	89:4	90:4	94:1	na	na	na	1.8	2
		2	2			0	4	1					

Business Expectations	na	81:1	82:3	83:4	86:2	88:3	90:4	94:2	95:3	99:3	00:04	3.3	3
		3	3	7	1	5	4	0	7	2	1		
Job Vacancies	na	81:3	82:3	85:2	87:3	89:2	91:2	94:3	97:2	00:02	01:03	0.1	0.5
		1	3	1	-4	2	2	-1	0	-1	-2		
Production Expectations	na	81:1	82:4	84:1	86:3	88:3	90:4	94:2	96:2	99:4	01:01	2.5	2.5
		3	2	6	0	5	4	0	4	1	0		
Interest Rates	80:1	81:0	82:4	85:1	86:1	89:2	93:3	94:4	98:3	00:01	01:02	-0.5	0.5
	1	0	2	2	2	2	-7	-2	-5	0	-1		
Secured Housing Finance	na	80:3	82:3	85:2	86:2	88:3	89:4	94:1	95:2	99:4	00:04	3.4	2
		5	3	1	1	5	8	1	8	1	1		
Trade Factor	80:2	80:4	82:3	84:4	86:4	88:3	90:4	94:1	95:2	na	na	3	3
	0	4	3	3	-1	5	4	1	8				
USA GDP	80:3	81:2	82:2	84:2	87:1	90:2	91:2	94:3	95:4	00:02	na	1	0.5
	-1	2	2	5	-2	-2	2	-1	6	-1			

GDP CVM = chain volume measure of GDP, the target or reference series for the XCLI

P = peak

T= trough

Several explanations might be offered for this, including (but not confined to) the following:

- Changes in the structure or functioning of the Australian economy-say, the shift from goods-producing to service industries, or changes in financial markets-might imply that our original selection of leading indicators is outdated. Also, for example, international influences on the Australian economy might need to be broadened beyond US GDP and the terms of trade, to take account of links with other major economies, and of financial as well as trade links.
- Changes in the cyclical pattern of aggregate economic activity during the 1990s-especially the sustained output growth-might imply that the 1970s and 1980s pattern of periodic deviations from the growth path has broken down. It might be necessary to fine-tune our methods for extracting the cyclical components from GDP (and from the leading indicators), or even to adopt a quite different extraction technique.

The original developers of the XCLI evaluated several hundred candidate leading indicators. For the recent review, the ABS did not undertake such a comprehensive search. Instead, we evaluated a compact set of alternative indicators that were thought to express some aspects of Australia's recent economic experience that are missing from the existing XCLI components. These included the US and Japanese exchange rates relative to the Australian dollar, real GDP for Japan, retail turnover volume and an inventory-to-sales ratio.

Although some of the new candidate indicators provided early signals of one or more turning points, none of them would (if incorporated in the XCLI) have delivered an appreciable improvement in the predictive performance of the composite indicator during the 1990s. A more wide-ranging, data-driven search for components might have identified indicators that better picked up some of the historical turning points, but there is little reason to expect that a search of that kind would ensure better predictive performance into the future.

REVIEWING THE METHODS

Our method for extracting the business cycle from GDP and the corresponding cyclical components from the eight leading indicators is based on a particular kind of "filter"-namely, the Henderson moving averages that also play an important role in X-11, the tool that the ABS uses for seasonal adjustment and deriving trend series. Details of the Henderson moving averages are

described in the ABS Information Paper "A Guide to Interpreting Time Series-Monitoring Trends" (cat. no. 1349.0). In broad terms, the extraction of the business cycle proceeds in three steps:

- a 33-term Henderson moving average (H33) is applied to each seasonally adjusted quarterly series, to derive a long-term trend
- a 7-term Henderson moving average (H7) is applied to each seasonally adjusted quarterly series, to derive a short-term trend-this is the kind of trend series that appears in many ABS publications
- the long-term trend is subtracted from the short-term trend, to derive the business cycle component.

Three factors led the ABS to re-evaluate its approach.

First, the Henderson moving averages were originally chosen in order to derive a series dominated by economic cycles (wavelengths) of between two and eight years; these are broadly the lengths of time observed between one peak of Australian economic activity and the next (or between one trough and the next). But the match between the H33/H7 moving averages and historical business cycles is only approximate-some strength remains for cycles shorter than two years or longer than eight years, and the strength of some cycles within the two-to-eight-year band is weakened by the existing filtering technique.

Second, Australia experienced an unusually long period of solid growth during the 1990s. Cyclical analysts have put forward various interpretations of this phenomenon. Some assert that the business cycle has lengthened in Australia and, possibly, in other countries. Others assert that the amplitude or strength of the business cycle component has just been damped-that is, there has recently been a smaller difference between economic activity levels at peaks and troughs. And there are varying views about whether such changes are a passing phenomenon, peculiar to the past decade, or are likely to persist. It is of economic importance to know which (if any) of these views may be correct-but, in the present context, they all pose similar problems to the analyst who is trying to extract the business cycle components from somewhat noisy data.

Third, the family of Henderson moving averages is only one of a rich variety of analytical techniques available for business cycle extraction, and some analysts claim better results with other techniques.

Thus, the ABS has recently undertaken a review of its methods for extracting the cyclical components of economic time series¹. We found that using some of the alternative methods improved the appearance of the business cycle and the XCLI. There were fewer small ripples or false turning points in the two series, so it was easier to identify peaks and troughs. But adopting one of the alternative methods would not have produced a substantial improvement in the XCLI's predictive performance. It would still have missed some turning points in the business cycle, falsely signalled others, or displayed very variable lead times-all of which would have vitiated its usefulness as a leading indicator.

CESSATION OF THE XCLI

The poor recent performance of the XCLI implies that it is adding little or no value to the information available to policy makers and other users. Other agencies, private sector organisations and individual investigators produce leading indicators using a variety of data and methods. In recent years, most have experienced somewhat greater difficulty doing cyclical analysis and formulating forecasts, but some have maintained at least moderate success. In the ABS's view, the XCLI could be only improved (and even then not with certainty) by a complete overhaul of methods and a review of component series to reflect the contemporary structure and

behaviour of the Australian economy. This might require the introduction of judgment-based tuning to our methods, in place of the hands-off Henderson filter technique for extracting the business cycle and defining turning points.

The ABS has decided to cease publication of the XCLI after this quarter.

THE FUTURE

Notwithstanding the fact that the ABS will cease compiling a composite leading indicator, we see some value in applying the analytical methods mentioned in this article to assist understanding of:

- the state of important segments of the economy (eg, peaking, troughing, decelerating growth, etc.) and
- where important segments are in relation to overall economic activity (eg, leading or lagging an acceleration in GDP, etc.)

During the coming year, the ABS plans a series of short statistical analyses, probably beginning with the housing sector and the labour market. The outcomes of such analyses may be used to enhance our displays of, and commentary about, economic series in **Australian Economic Indicators** and other publications.

FURTHER INFORMATION

For more information about the review of the XCLI, contact Dr Shiji Zhao on phone 02 6252 6053 or email shiji.zhao@abs.gov.au

REFERENCES

Salou, Gerard and Cynthia Kim, "**The Australian Business Cycle, 1959-1992**", **Australian Economic Indicators**, cat. no. 1350.0, August 1992

Salou, Gerard and Cynthia Kim, "**Leading Indicators of the Australian Business Cycle: Performance Over the Last Two Decades**", **Australian Economic Indicators**, cat. no. 1350.0, October 1992

Information Paper: An Experimental Composite Leading Indicator of Australian Economic Activity, cat. no. 1347.0, June 1994

ENDNOTES

(1) Among the alternative methods for extracting the cyclical components that were evaluated during the XCLI review were:

- Henderson moving averages of different lengths
- Hodrick-Prescott filters-these are used by some other agencies for analysing business cycles and constructing leading indicators
- "band-pass filters" that permit more exact extraction of the wavelengths thought to reflect the Australian business cycle.

Certain other methods that were considered (but not tested empirically) were regime-switching

models, Phase Average Trends and Bry-Broschan methods.

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